

Sericulture

1. Sericulture is the rearing of silkworms to produce silk.
2. The term sericulture is derived from a Greek word sericos.
3. The word sericos means silk.
4. The word culture refers to rearing.

Life cycle of Mulberry silkworm (*Bombyx mori*)

1. life cycle of *Bombyx mori* comprises four stages.
2. They are egg, larva, pupa and adult.
3. The duration of life cycle is approximately 45 days.
4. The egg is oval in shape.
5. The egg has outer covering called chorion.
6. It has an opening at one end . it is called micropyle.

- 7.The egg hatches out into a larva.
- 8.The larval period consists of 20-24 days.
- 9.The larva is black in colour.
- 10.The body is covered with bristles.
- 11.It undergoes the process of moulting.
- 12.Larval life consists of 5 larval stages.
- 13.Moulting results in the production of the 5th instar larva.
- 14.The larva is phytophagous. (plant eater)
- 15.It is a voracious feeder.
- 16.It feeds actively on mulberry leaves.
- 17.Then the larva passes onto the next stage called pupa.
- 18.Pupa is covered by a cocoon. The cocoon is made up of silk fibre secreted by the 5th instar larva.
- 19.Pupa lives inside the cocoon.
- 20.Pupa does not move and feed.

21. Adult organs develop during this stage.

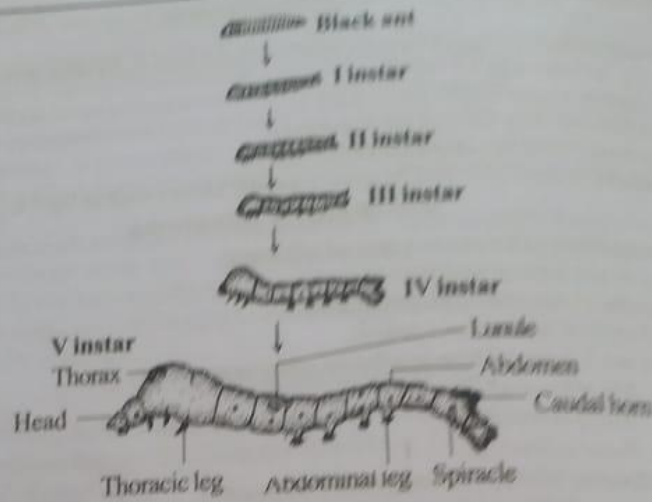


Fig.21.6: Larval stages of *Bombyx mori*.

- It undergoes the process of **moulting**.
- Larval life consists of 5 **larval** stages.
- Moulting results in the production of the 5th instar larva.

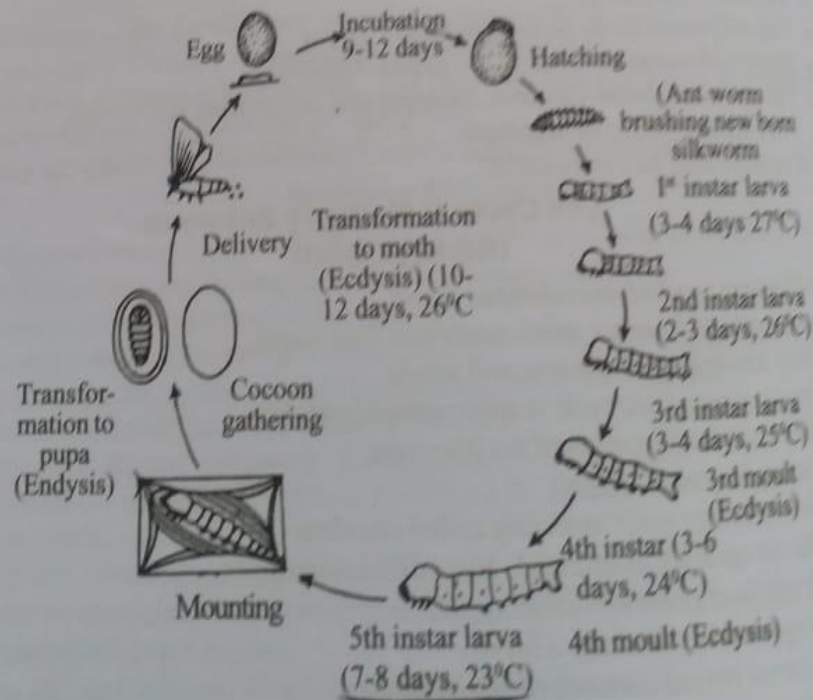


Fig.21.7: Life cycle of *Bombyx mori*.

22.Pupa consists of head, thorax and abdomen.

23.The pupal stage lasts for about 10-12 days.

24.The adult emerges from pupa.

25.The adult life lasts for about 3-5 days.

26.The adults do not feed.

27.They live for reproduction. After copulation, they die.

28. Females are larger than males.

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- It is a **voracious** feeder.
- It feeds actively on mulberry leaves.
- Then the larva passes onto the next stage called **pupa**.
- Pupa is covered by a **cocoon**. The cocoon is made up of silk fibre secreted by the 5th instar larva.
- Pupa lives inside the cocoon.
- Pupa does not move and feed.
- Adult organs develop during this stage.
- Pupa consists of **head, thorax** and **abdomen**.
- The pupal stage lasts for about 10-12 days.
- The adult emerges from the pupa.
- The adult life lasts for about 3-5 days.
- The adults do not feed.
- They live for **reproduction**. After **copulation**, they die.
- Females are larger than males.

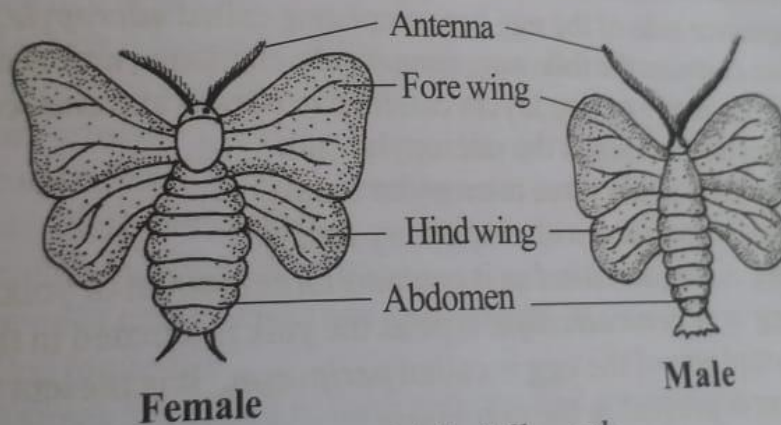


Fig.21.8: Silk moth.

Life Cycle of Non-Mulberry Silkworm

- The life cycle of **Eri silkworm** is taken as an example for the **non-mulberry silkworm**.
- **Eri silk** is secreted by **Philosamia ricini**.
- It inhabits **Assam**.
- It feeds upon **castor leaves**.
- It belongs to **multivoltine** race.
- The life cycle of **Eri silkworm** consists of 4 stages.

Varieties of silk worms

1. Mulberry silk worm
Bombyx mori
2. Tasar silk worm
Antheraea mylitta
3. Muga silk worm
Antheraea assama
4. Eri silk worm
Philosamia ricini

1. Mulberry silk worm

Bombyx mori

1. The insect producing mulberry silk is a domestic variety of silkworms, which has been exploited for over 4000 years.

2. The races of mulberry silk worm may be identified on the basis of geographical distribution as Japanese, Chinese, European or Indian origin; or as Uni-, Bi- or Multi-voltine depending upon the number of

generations produced in a year under natural conditions; or as Tri-, Tetra- and penta moulters according to the number of moults that occur during larval growth; or as pure strain and hybrid variety according to genetic recombination.

3. Life cycle of the silkworm consists of four stages i.e. adult, egg, larva and pupa. The duration of the life cycle is six to eight weeks depending upon racial characteristics and climatic conditions.

4. Egg is round and white. The weight of newly laid 2,000 eggs is about 1.0g. It measures 1-1.3mm in length and 0.9-1.2mm in width.

5. After 10 days of incubation, the eggs hatch into larva called caterpillar. After hatching caterpillars need continuous supply of food, because they are voracious feeders. Newly

hatched caterpillar is about 0.3cm in length and pale yellowish white.

6.Pupa is the inactive resting stage of the silkworm.

7.The adult of *Bombyx mori* is about 2.5cm in length and pale creamy white.

Tasar Silkworm

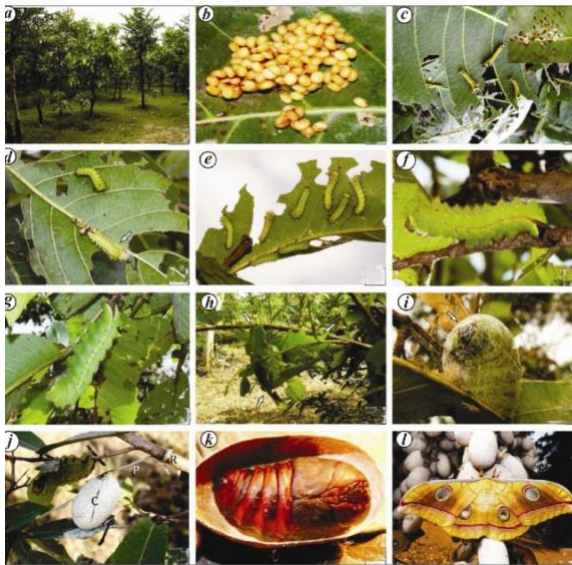
1. Serval species of *Antheraea* are exploited for production of wild silk known as tasar silk.

A. mylitta are reared in central and north eastern parts of India.

2.A single female lays about 150-200 eggs in two days. The eggs oval and dorso-ventrally flattened.

3.The larvae hatch out in ten days. The hatching larvae are kept in cups made up of the leaves and the cups are uniformly distributed over the host trees.

4. The first phase of cocoon formation is the construction of a scaffold of silk threads between leaves of food plant and the production of stalk or peduncle which attaches the cocoon to the leaf petiole / tree twig.

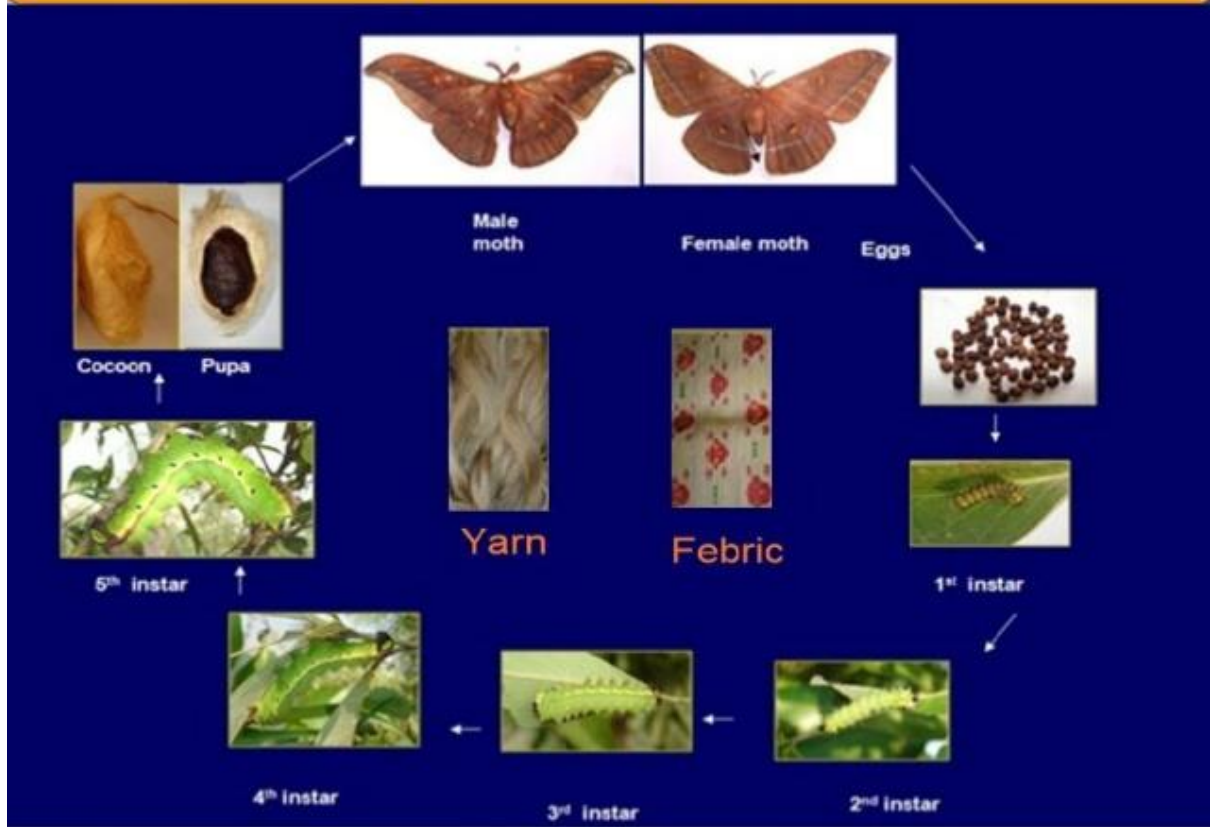


Muga Silkworm

1. Muga is an Assamese word indicating the golden brown (amber) colour of the cocoon. The Muga silkworm, *Antheraea assama* is mainly confined to the Brahmaputra valley of Assam and foothills of East Garo hills or Meghalaya. Its distribution in the wild state, however, extends from western Himalaya to Nagaland, Cachar district of Assam and south Tripura.

2. The Muga silkworm is multivoltine and passes through four moults and five instar stages. Generally 4-5 crops are raised in a year. Muga silkworm is a polyphagous insect. It feeds on the leaves of several kinds of trees, but *Machilus bombycina* (Ven. som) and *Litsaea polyantha* (Vern. Soalu) are the two principal host food plants of muga silkworm.

Life Cycle of Muga Silkworm



Eri Silkworm

The silk produced by *Philosamia ricini* is called Eri silk. The distribution of Eri silkworm is confined to Assam and bordering districts of West Bengal. The Eri silkworm is multivoltine and reared indoors 5-6 times a year. Optimum required are 24-28⁰ C temperature and 85-90% humidity. Adults moths emerge from morning to mid day; males emerge earlier than the females. After an hour of emergence mating occurs and continues till evening. Males are then separated. Both male and female have brown (chocolate), black or green coloured wings with white crescent markings and woolly white abdomen. The male is smaller than female and bear bushy antennae and narrow abdomen.

Eri worms are polyphagous having primary as well as secondary food plants (hosts). Primary food plants are *Ricinus communis*

(Vern. Castor) and *Heteropenax fragrans*
(Vern. Kasseru).



Rearing of Silkworms

The rearing of silkworm refers to the growing of silkworms in an ideal environment to produce cocoon for silk.

It is a sericulture operation.

In India, rearing is carried out 5-6 times in a year.

For a successful rearing of silkworms the following requirements should be fulfilled:

- Adequate supply of mulberry leaves.
- Large number of labours.
- Rearing house.
- Rearing house must be a concrete building with ceiling of wood.
- The house should be lighted.
- Rearing appliances are needed.

Silkworm Rearing House

Silkworms are reared in a rearing house. It is a concrete building with thatched or tiled roof.

There should be 3 rooms, one for rearing, another for keeping appliances and the third for storing mulberry leaves.

Rearing Appliances

Silkworm rearing requires a set of appliances.

They are the following:

- | | |
|-----------------|------------------|
| 1.Rearing stand | 7.Chopping board |
| 2.Rearing trays | 8.Chopping knife |
| 3.Chop sticks | 9.Mats |
| 4.Feather | 10.Feeding stand |
| 5.Leaf basket | 11.Cleaning net |
| 6.Leaf chamber | 12.Mountages |

Rearing Stand

- Rearing stand is used for keeping the rearing trays.
- It is made of wood or bamboo.
- It is about 2.5m in height and 1.5m in length and 0.65m breadth.
- It has 10 to 12 shelves to keep rearing trays.

- The four legs of the sand are placed on antwells.
- Antwell is used to restrict the free movement of ants.
- Antwell is made of concrete cement.
- It is filled with water.
- It is useful in preventing the entry of ants.

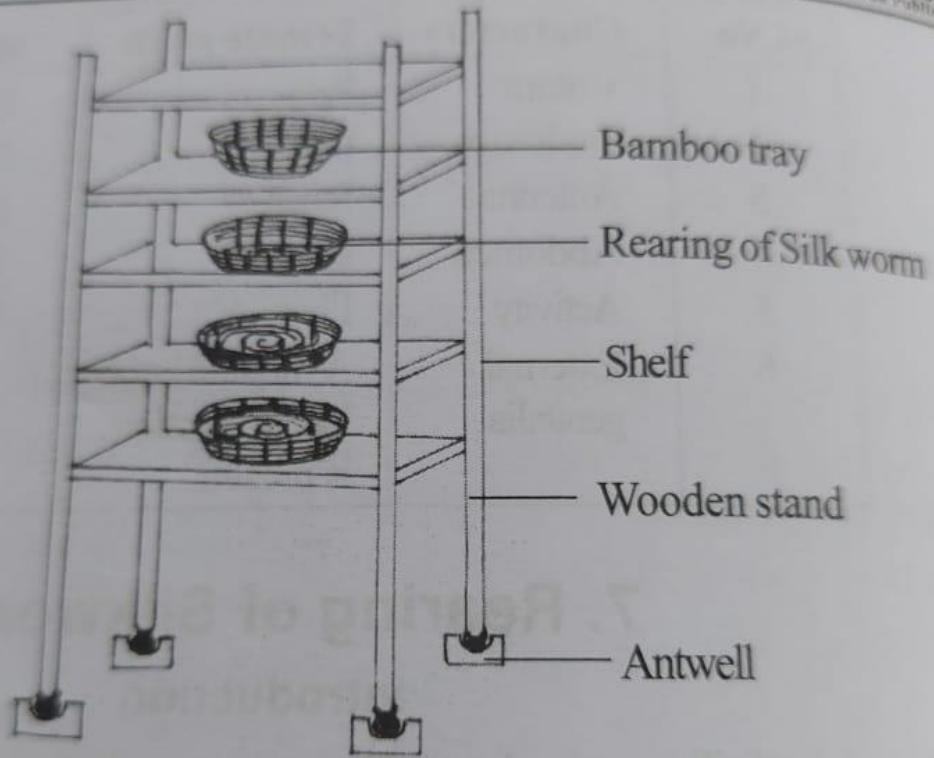


Fig.21.13: Rearing stand.

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Rearing Trays

- Rearing trays are used for rearing silkworms.
- The trays are made of bamboo or wood.
- The trays are coated with cowdung paste mixed with formalin.
- A large number of silkworms can be reared in single tray.
- The trays are stacked on the rearing stand.
- The bottom of the tray is spread with paraffin paper. It prevents evaporation of water. It helps in regulating humidity.
- In village, sheets made of polythene, dried banana leaves and dried banana barks are also used instead of paraffin paper.
- Foam rubber strips are also used in the trays to keep high humidity.
- There are cut into 2.5 x 2.5cm strips.

- They are soaked in water.
- Then they are placed around the bed of silkworms.

Chop Sticks

- Chop sticks are the two bamboo sticks (17.5cm).
- They are pointed at one end.
- The other ends are tied by a small thread.
- They work like a forceps.
- They are used to pick up the larvae.

Feather

- Feather is a bird's feather.
- It is used to brush the newly hatched larvae from the egg card to the rearing trays.
- It is also used to spread the larvae.



Fig.21.14: Chop stick.

bird's feather.

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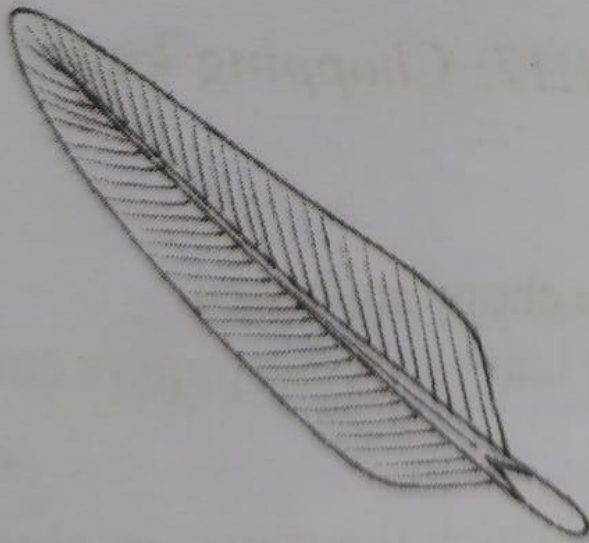


Fig.21.15: Feather.

Leaf Basket

- Leaf basket is a bamboo basket.
- It is used to carry mulberry leaves from the field to the rearing house.

Leaf Chamber

- Leaf chamber is made of wooden reepers.
- This chamber is closed on the sides and bottom.
- It is used to store the mulberry leaves.
- Wet gunny bags are placed on the leaf chamber to keep the mulberry leaves fresh.

Chopping Board

- Chopping board is a rectangular mulberry board which is used for cutting leaves.
- It is made of wood.

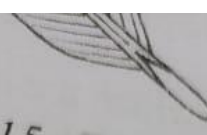


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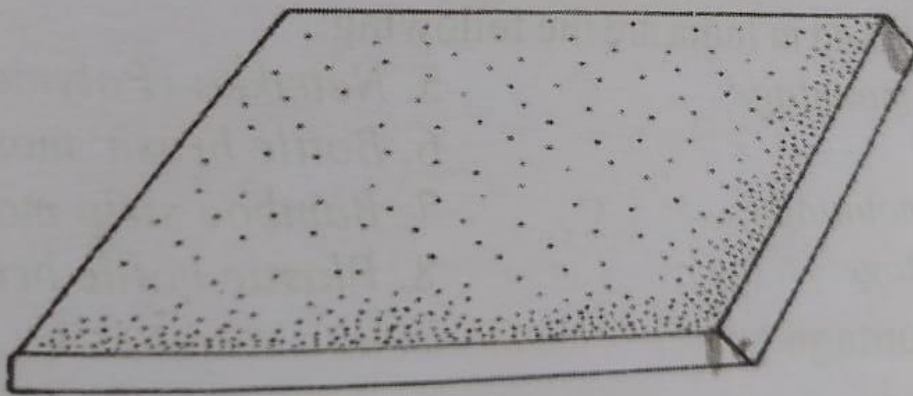


Fig.21.16: Chopping board.

Chopping Knife

- Chopping knife is a sickle-like knife with a sharp blade.
- It is used for cutting leaves.

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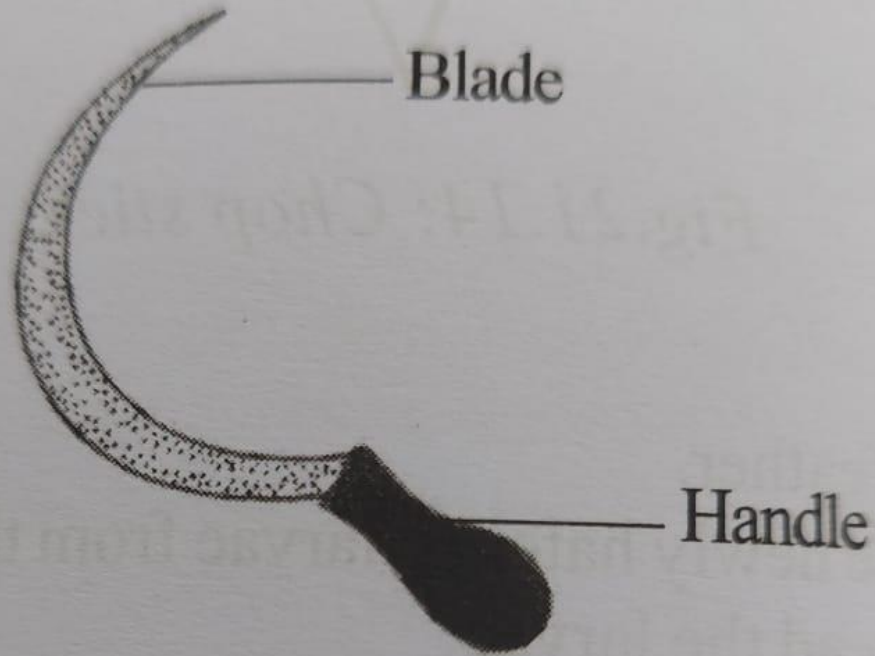


Fig.21.17: Chopping knife.

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Mats

- Mats are placed beneath the chopping board.
- They are used to collect cut leaves. Newspapers can also be used.

Feeding Stand

- Feeding stand is a stand on which the trays are placed after the removal of tray from the stand, to do feeding and other works.

Cleaning Net

A nylon net is used to clean the bed. The net is spread over the tray. Fresh chopped leaves are spread on the net. Worms of the tray crawl through the meshes of the net and feed the fresh leaves.

The net is removed and worms are transferred to a new tray. The old tray is removed.

Mountage

- Mountage is an appliance used to help the silkworms to spin the cocoon.
- It is otherwise called cocoonage.
- Various types of mountages are used in India.
- It is the most important appliance used in rearing silkworms.
- It determines the quality and quantity of good cocoons.
- Mountages are made up of wood, bamboo, plastic, grass, dry leaves and twigs.
- The mountages used in India are the following:
 - 1.Paddy straw mountage
 - 2.Chandrika
 - 3.Screen-type mountage
 - 4.Plastic mountage
 - 5.Netrikka (Polymer mountage)
 - 6.Bottle brush mountage
 - 7.Bamboo strip mountage

8. Plastic bottle brush

1. Paddy Straw Mountage

- Paddy straw mountage is traditional.
- It is very cheap, effective and gives good yields.
- It is a heap of paddy straw.
- As straw absorbs the excessive water, the worm can spin with a suitable space.
- It is disadvantageous because cocoons may be crushed.
- Harvesting is a problem.

2. Chandrika

- Chandrika is a mountage which helps the silkworms to spin cocoons.
- It is a spiral mountage.
- It is made of bamboo mat.
- It is supported by spilt bamboo reapers on all sides.
- The mat is provided with a tape of 4cm width and is wound spirally.

- The bamboo tape is also supported by 3 long bamboo strips.
- About 1000 worms can be reared on this mountage.
- The advantages are:
 - It is made from the locally available materials.
 - It is easy to handle.
 - It is easy to mount and harvest.

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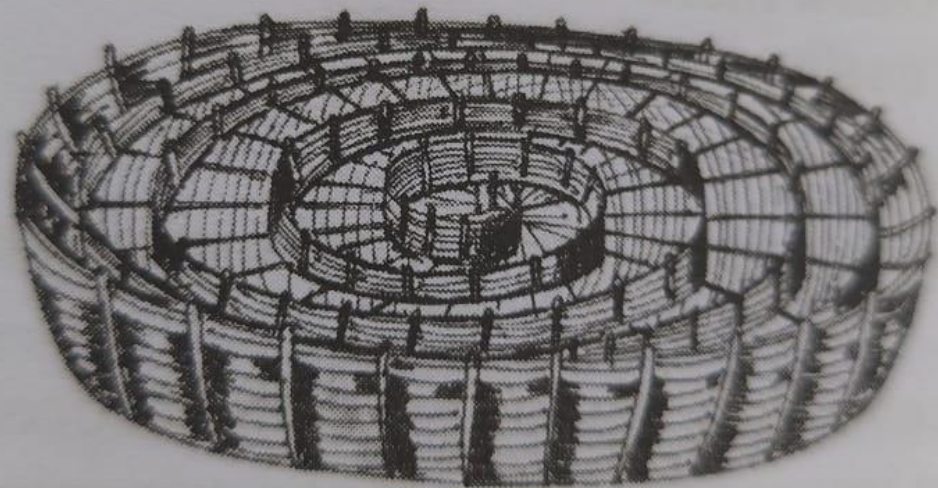


Fig.21.18: Chandrikes.

Mountage

Mountage is used to mount silkworms. It

3.Screen Type Mountage

- Screen type mountage is used to mount silkworms. It is made up of bamboo or wood.
- The longitudinal strips are used instead of spiral tape.
- The screen can be folded and stored.
- This type of mountage is clean and more ventilated.
- So cocoons are in good quality.
- It is more durable than Chandrika.

Plastic Mountage

- It is an appliance helping the silkworm to spin cocoon.
- Plastic mountages are very similar to Chandrika.
- They are made of plastics.
- It has better durability.
- It is easier to clean and handle.

- It is somewhat cheap.
- It produces the cocoons of better commercial characteristics.

Netrikka (Polymer mountage)

- Netrikka is a type of mountage made of netlon polymer. It helps the silkworm to spin cocoon.
- It is net-like.
- It is marketed by Netlon India.
- It helps to produce quality cocoons

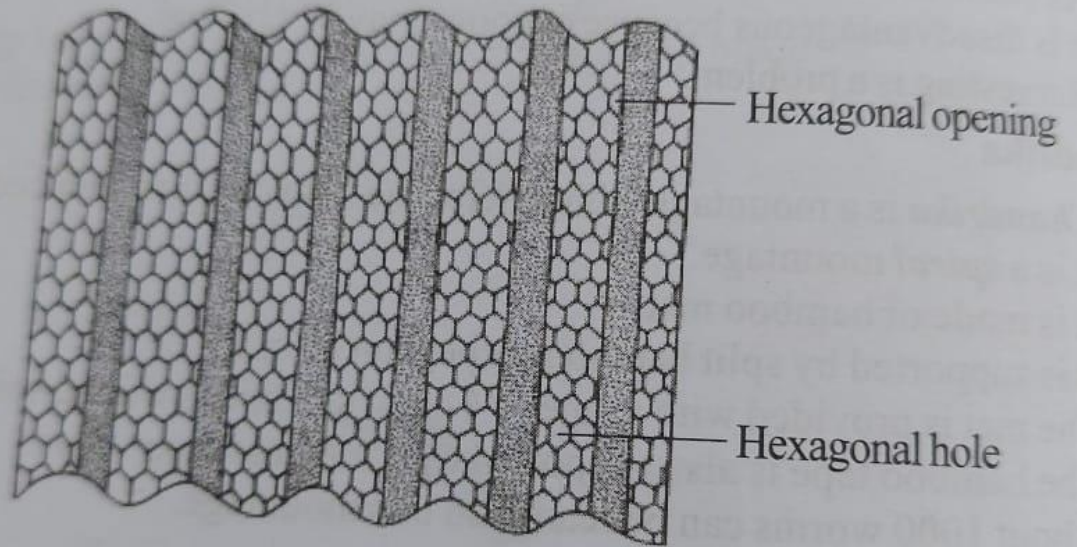


Fig.21.19: Netrikka.

like.

keted by *Netlon* India.

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Mountage

ush mountage is a newly produced mountage used to help the silkworms to spin their cocoons.

up of coconut fibre rope and midrib of coconut leaves.
of coconut leaves are used as support.

Bottle Brush Mountage

- Bottle brush mountage is a newly produced mountage used to help the silkworm to spin cocoon.
- It is made up of bamboo strips.
- Each bamboo strip is 3cm is width and 0.5cm in thickness.
- The strips are arranged with a gap of 3cm.
- The strips are attached to the reepers or inserted in grooves.
- The reepers should be 3 feet in length.

Plastic Bottle Brush

- It is a mountage used to help the silkworms to spin the cocoon.
- It is made up plastic.
- It is fabricated out of detachable pieces.

- Each piece has 8 branches with 2 sub-branches.
- Each branch has a length of 1.5 cm.
- Each sub-branch has a length of 9cm.
- The distance between two branches is 1cm.
- The distance between two sub-branches is 3cm.
- Both the branches are arranged circularly.
- It is cheap, durable and light in weight.
- It is easy to disinfect.
- It is non-biogradable.

Properties of silk

Strength:

Silk is that the strongest fibre. It's a purpose of two. 4 to 5.1 grams per denier.

Shape and appearance:

Silk filaments square measure terribly fine and long. They regularly live regarding one thousand to 1300 yards long. The breadth of the silk is from nine to eleven microns.

Elasticity:

It's associate elastic fibre and its physical property varies because it is fibre. Silk fibre could also be stretched from $\frac{1}{7}$ to $\frac{1}{5}$ its original length before breaking.

Resilience:

Silk retains the form and resists wrinkling very well.

Drapability:

Silk encompasses a pliability and suppleness that motorassisted by its physical property and resilience offers it physical property and resilience offers it glorious drapability.

Heat Conductivity:

Since silk could be a macromolecule fibre. It's a non conductor of warmth like wool. Thence it's used for winter attire.

Absorbency:

The great absorbtive property of silk additionally contributes to its impact in hotter atmosphere.

Cleanliness and wash ability:

Silk is hygienical material as a result of its swish surface doesn't attract dirt. It also can be simply clean by delicate soaps and cleansing.

Shrinkage:

As a result of the filament long, swish surface silk have traditional shrinkage which might be simply rehabilitated by ironing at moderate heat and damp conditions.

Uses of silk

1.Bridal and formal wear:

Silk is a staple of many gowns and dresses thanks to its beautiful drape, and the long floats

of yarn on one side create a dressy and lustrous appearance.

2.Ties and scarves:

The material's strength and nuances with color make it ideal for accessories. Many high-end ties are made from heavy silk, Which allows for tightly woven patterns, rich colors, and durable material. Silk is also a great material for scarves for both decoration and for warmth.

3.Bedding:

Silk sheets are the height of luxury and the material's softness and absorbent nature makes it truly shine in the bedroom.

4.Parachutes:

Silk was originally used for parachutes for its strength and elastic properties; however nylon is more commonly used today.

5.Upholstery:

Silk is used to cover furniture and pillows, and thanks to its strength and durability. It provides a long-lasting covering.

6.Wall hangings:

Decorative wall hangings are often woven from silk, as the material is beautiful and dynamically reacts with colors and dyes.

7.Bicycle tires:

The material is sometimes used in the tire's casing because of its lightness, durability, and flexibility. Since silk can be expensive, the casings can also be made from nylon and cotton.

8.Surgical sutures:

Since silk is a natural material, it has amazing uses in medicine. The material does not cause an autoimmune response and cannot be absorbed by the human body.